

# Annex - Text Classification to Inform Suicide Risk Assessment in Electronic Health Records

Table A: Description of STRUCT and GATE features used for classification.  
All STRUCT features are derived from strucutre EHR fields.  
All GATE features are produced using machine learning classifiers to determine the class (Positive, Negative, Unknown, etc.) of the relevant search term.

Structured Feature Name	Definition	Values
Accommodation_Status	Patient's accommodation status	Homeless, Institution, Mainstream Housing, Mobile Accommodation, Unspecified
age_admistart	Age at the start of the admission	Integer value
all_docs_30_days_to_admidate	Number of documents in 30-day pre-admission period	Integer value
Disabled	Patient has a physical disability	Yes/No
Employment	Patient's employment status	Employed, Self Employed, Unemployed, Unspecified, Volunteer
Ethnicity	Patient's ethnicity	African, Asian, British, Carribean, Mixed, Other black, Unspecified, White
Interpreter_Needed	Patient does not speak English and requires an interpreter	Yes/No
Lives_With	Patient's living situation	Alone, Children Only, Family, Friends/Relatives, Not Known, Partner, Partner & Children
Marital_Status	Patient's marital status	Divorced, Partner, Single, Unspecified, Widowed
PSA_Employment	Patient's employment status	Employed, Unemployed, Unspecified
sex	Patient's sex	F/M
Substance_Abuse_Current	Patient has current substance abuse	Yes/No
Substance_Abuse_Past	Patient has a history of substance abuse	Yes/No
Welfare_Benefits	Patient receives welfare benefit	Yes/No

GATE Feature Name	Definition	Search term
Abstract thinking	Application to extract occurences of concrete thinking. Classes produced: Positive, Negative and Unknown. Positive annotations includes: Occurrences of Concrete thinking or concrete cognition. Unknown indicates- Concrete answers about one particular area. Negative annotations includes: no evidence of concrete thinking.	concrete
Aggression	Application to identify mentions of aggression. Classes produced: Positive, Negative and Unknown. Positive mentions include: Reported to be quite aggressive towards ..., Violence and aggression, requires continued management and continues to reduce in terms of incidents etc. Negative mentions include: no aggression, no evidence of aggression etc. Unknown mentions include: annotations included unclear statements.	aggress*

Agitation	<p>Application to identify mentions of agitation.</p> <p>Classes produced: Positive, Negative, and Unknown.</p> <p>Positive mentions include: very agitated at present, he was agitated, He was initially calm but then became agitated and started staring and pointing at me towards.. etc.</p> <p>Negative mentions include: did not seem distracted or agitated, not agitated, no evidence of agitation.</p> <p>Unknown mentions include: annotations include unclear statements.</p>	agitat*
Amphetamine	Application to determine whether a patient has been exposed to amphetamine.	[Aa]mphetamine
Anhedonia	<p>Anhedonia means the inability to experience pleasure from activities usually found enjoyable. Application to identify patients who have experienced anhedonia. Classes produced: Positive, Negative, Unknown. Positive indicates the presence of the symptoms. Negative indicates the absence of the symptoms. Unknown indicates the presence or absence cannot be ascertained, often as the term is used as a warning or the clinician has not clearly stated that anhedonia or 'some depressive symptoms, may be due to anhedonia.</p>	anhedon*
Apathy	<p>Application to extract the presence of apathy. Classes produced: Positive, Negative, Unknown. <b>Positive mentions</b> include any indication that apathy was being reported as a symptom: e.g. continues to demonstrate A; symptoms include A; he is withdrawn, attributable to A; his apathy ... ; some degree of A noted; presentation with A; his report of A; given patient's level of A. Most apathy statements were found to be accompanied by 'negative symptoms' (i.e. rather than depressive).</p> <p><b>Very few negative mentions found.</b> Usual statements (denied A; no evidence of A etc.)</p> <p><b>'Unknown' annotations include:</b> apathy mentioned as a hypothetical cause of something else (e.g. inactivity) rather than described as being present; apathy mentioned as a possibility in the future (e.g. may develop A), or as a possible side effect of medication (rather than actually present), or as an early warning sign. Also *apathy* found in quite a few names.</p>	apath*
Appetite	<p>Application to extract symptoms of Appetite. Classes produced: Postive, Negative and Unknown. <b>Positive annotations</b> applied to adjectives implying a good or normal appetite: fine; OK; reasonable; alright; preserved; satisfactory. Often described in combination with other symptoms (e.g. sleep and appetite normal; sleep and appetite: both preserved).</p> <p><b>Negative annotations</b> applied to adjectives implying a poor/declining appetite: loss of; reduced; decrease in; not so good; diminished; lack of; not great. Also often in combination with other symptoms (poor sleep and appetite; loss of energy and appetite).</p> <p><b>'Unknown' annotations</b> include insufficiently informative adjectives: not changed; varies; increased; improving. Also hypothetical mentions, as a potential side effect, as an early warning sign, as a description of a diagnosis (rather than patient experience), describing a relative rather than the patient, 'appetite suppressants'.</p>	appetite
BFlat_Affect	<p>Application to extract the presence of Blunted Flat Affect.</p> <p>Classes produced: Positive and Negative.</p> <p>Positive annotations include: His affect remains very blunted, Objectively flattened affect, State ZZZZZ continues to appear flat in affect etc.</p>	Keyword: affect; Modifier: blunt*, flat*, restrict* (all observation doesn't have the modifier on)

Bradykinesia	<p>To identify patients who have either have bradykinesia, stiffness or shuffling gait as symptoms or signs in the context of dementia.</p> <p>Classes produced : positive, negative and unknown.</p> <p>Positive: evidence of presence of bradykinesia, stiffness or shuffling gait as symptoms or signs.</p> <p>E.g. ZZZZ was examined and Dr. that this could be due to Risperidal deport as she complained of stiffness..... ZZZZ remains very stiff an observed shuffling. ZZZZ continues to mobilise with shuffling gait. Motor symptoms – moderate bradykinesia L&gt;R.....</p> <p>Please Note: Joint stiffness has been considered as positive. Stiffness during nursing care has been considered as positive. All causes of these symptoms/signs have been accepted.</p> <p>Negative: No evidence of bradykinesia, stiffness or shuffling gait.</p> <p>E.g. She does not have any neck stiffness. ZZZZ managed walking with shuffling gait. He was moving easily in bed and transferring independently with no bradykinesia or tremor.</p> <p>Unknown: The text is irrelevant or not clear to show whether or not the patient has either bradykinesia, stiffness or shuffling gait.</p> <p>E.g. Difficult to assess if it has caused any stiffness....She explained that the door opens very easily but is then very stiff to shut. SHO to look for stiffness....bradykinesia.</p>	bradykine*, stiff* and shuffling gait
Cannabis	<p>Application to extract occurrences of cannabis use.</p> <p>Classes produced: Positive, Negative</p>	cannabis, marijuana, weed, pot, hash, skunk
Catatonic Syndrome		catatoni*
Circumstantial Speech	<p>Application to extract occurrences where circumstantial is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: loose associations a loss of goal, overinclusiveness and circumstantially; He had thought derailment and circumstantially etc.</p> <p>Negative annotations include: The five Risk items (R) are concerned with forecasting the future social, living and treatment circumstances etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	circumstan*
Cocaine	<p>Application to extract occurrences of crack/cocaine use.</p> <p>Classes produced: Positive, Negative</p> <p>Positive: A positive for a highlighted sentence that indicates an exposure of the patient, past or present, to cocaine or crack.</p> <p>Negative: A negative indicates that the highlighted sentence shows an explicit lack of use or exposure to cocaine or crack.</p>	[Cc]ocaine, [Cc]rack
Coherence	<p>Application to extract occurrences describing when patients have good or poor coherence</p> <p>Classes produced: Positive, Negative, Unknown</p> <p>Positive annotations include references to good coherence.</p> <p>Negative annotations include: he could not hold a coherent conversation, she was worried about him as he was sounding confused and incoherent etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	
Concentration	<p>Application to identifies when patients have poor or good concentration.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: My concentration is still poor, she found it difficult to concentrate etc.</p> <p>Negative annotations include: Good attention and concentration, Participating well and able to concentrate on activities etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	[Cc]oncentrat

Deficient abstract thinking	<p>Application to extract occurrences of concrete thinking.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations includes: Occurrences of Concrete thinking or concrete cognition. Unknown indicates- Concrete answers about one particular area.</p> <p>Negative annotations includes: no evidence of concrete thinking.</p>	concrete
Delusion	<p>Application to extract occurrences where delusions are apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive mentions include: paranoid delusions; continued to express delusional ideas of the nature etc.</p> <p>Negative mentions include: No delusion, denied delusion etc.</p> <p>Unknown mentions include: Present or Absent of Delusion is not clear.</p>	delusion
Derailment of Speech	<p>Application to extract occurrences where derailment of speech is present.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: he derailed frequently, There was evidence of flight of ideas and thought derailment in his language etc.</p> <p>Negative annotations include: The thought stream is normal as he uses sentences in consequences, with no derailment, Erratic compliance can further derail her stability etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	derail
Diabetes	<p>To identify patients who have diabetes with in the SLAM patient population.</p> <p>Classes produced: Positive, Negative, Unknown. A positive indicates that the patient has a diagnosis of diabetes.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>A positive indicates that the record shows the patient has a diagnosis of diabetes (type 1 or 2)</p> <p>e.g. “Suffers from Type 2 Diabetes”</p> <p>“ZZZZZZ has a history of Type 1 Diabetes Mellitus with poor glycaemic control”</p> <p>“This is a lady with a long standing Dissociative Motor Disorder as well as arthritis, high blood pressure, diabetes mellitus and high blood pressure as well as a history of breast cancer”</p> <p>“ZZZZZZ experiences reoccurring back pain and had an operation in 2002 for it, as well as physiotherapy. PJS records state that ZZZZZZ is on medication for Type II diabetes and palpitations and dizziness.”</p> <p>A negative indicates that the patient does not have a diagnosis of diabetes</p> <p>e.g. “Fasting bloods sent of last week rule out Diabetes Mellitus but Lab reports no sample was received”</p> <p>An unknown indicates that from the entry whether or not a patient has a diagnosis of diabetes.</p> <p>E.g. “appears to be the fourth or fifth presentation to KCH under similar circumstances (hypothermia and hypoglycaemia – thought to be due to unsuitable housing situation.”</p> <p>“ risks of hypo/hyperglycaemia”</p> <p>“beware of hypoglycaemia: 6%”</p>	Diabetes Mellitus, hypergly*, hypogly*, Type 2 Diabet*, Type 2 Diabet*, Type II diab*, T2DM, T1DM, T2D, T1D, Insulin Dependent Diabetes, Non Insulin Dependent, NIDDM, Diabetic ketoacidosis, ketoacidosis, hypersomolar, HONC
Disturbed Sleep	<p>Application to extract the occurrences of disturbed sleep.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive mentions include the following sorts of phrases: complains of poor sleep, poor sleep, sleep disturbed, sleep difficulty, sleeping poorly, not sleeping very well, cannot sleep, sleep pattern poor, difficulties with sleep</p> <p>Negative mentions include the following sorts of phrases: no sleep disturbance, sleeping without problems, no significant problems with sleep, sleep and [appetite] undisturbed, sleeping well, denied [xxx] and sleep disturbance.</p> <p>‘Unknown’ annotations include the following: call [nurse] if sleep disturbance, sleeping tablets, hoping to sleep, encourage to sleep, medication to help sleep, has been asleep all day, less disturbed sleep today, sleep disturbance as an early warning sign, sleeping habits present no problem, xxx might lead to sleep problems, settled down to sleep.</p>	

Echolalia	<p>Application to extract occurrences where echolalia is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: No neologisms, but repeated what I said almost like echolalis; intermittent echolalia etc.</p> <p>Negative annotations include: no echolalia, no evidence of echolalia, cannot remember any echolalia or stereotyped utterances etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	echola*
Echopraxia	<p>Application to extract occurrences where echopraxia is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: displayed a lot of echolalia and echopraxia, some of which may be triggers for ZZZZZ 's echopraxia etc</p> <p>Negative annotations include: He did not elicit any echolalia, echopraxia or coprolalia, There were no repetitive behaviours, echolalia, echopraxia etc.</p> <p>Unknown annotations include: annotations include unclear statements such as Mrs ZZZZZ to review her mimicry behaviours with a view to providing another opinion regarding whether they are best understood as tics (echopraxia), or whether they may be compulsive rituals</p>	echopra*
Elation	<p>Application to extract occurrences where elation is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: mildly elated in mood, elated in mood on return from leave, She appeared elated and aroused etc.</p> <p>Negative annotations include: ZZZZZ was coherent and more optimistic/aspirational than elated throughout the conversation, no elated behaviour etc.</p> <p>Unknown annotations include: annotations include unclear statements such as To others - no history of harm to others but in his elated state there is a risk of accidental harm to others as is pushing boundaries etc.</p>	elat
Elevated_Mood	<p>Application to extract occurrences where elevated is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: ZZZZZ 's paranoia and elevated mood have been resulting in conflict with others on the unit; Elevated mood, lability. Self medication with drugs;</p> <p>Negative annotations include: No overt evidence of mood elevation; No period of elevated mood/irritability etc.</p> <p>Unknown annotations include: annotations include unclear statements such as He was visited by his girlfriend and that elevated his mood etc.</p>	mood
Emotion Instability	Application to extract mentions of emotional instability.	
Emotional Withdrawal	<p>Application to extract occurrences of emotional withdrawal, developed as part of the Negative Symptoms of Schizophrenia project.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: Her mother described has becoming withdrawn, not communicating; . Sabri was visible on the ward appears withdrawn etc.</p> <p>Negative annotations include: He was not withdrawn; He was not observed to be sad or withdrawn during the assessment etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	withdraw
Energy	<p>Application to extract occurrences of energy.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive mentions were fairly self-explanatory (full of energy etc.)</p> <p>Negative mentions again were self-explanatory (no energy etc.)</p>	energy
Euphoria		euphor

Flight of idea (FOI)	<p>Application to extract occurrences where flight of ideas is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: Mrs ZZZZZ was very elated with by marked flights of ideas; marked pressure of speech associated with flights of ideas etc.</p> <p>Negative annotations include: no evidence of flight of ideas, no flight of idea etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	flight of idea
Formal thought disorder (FTD)	<p>Application to extract occurrences where formal thought disorder is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: deteriorating into a more thought disordered state with outbursts of aggression; There was always a degree thought disorder etc.</p> <p>Negative annotations include: Thoughts: No FTD; No signs of FTD.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	ftd, formal thought disorder
Grandiosity	<p>Application to extract occurrences where grandiosity is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: ZZZZZ was wearing slippers and was animated elated and grandiose, few grandiose statements regarding having been 'brought up with royalty' etc.</p> <p>Negative annotations include: No evidence of grandiose of delusions in the content of his speech, No evidence of grandiose ideas etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	grandios
Guilt	<p>Application to identifies when patients have olfactory, tactile and gestatory hallucinations.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: she then feels guilty/angry towards mum; Being hungry is easier to deal with than feeling guilty etc.</p> <p>Negative annotations include: no feeling of guilt; Denies feeling hopeless or guilty etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	
Hallucination	<p>Application to extract occurrences where hallucination is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: recalled experiencing auditory hallucinations, visual distortions and auditory hallucinations etc.</p> <p>Negative annotations include: No evidence of responding to any hallucinations or delusions, Not objectively hallucinated etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	Keyword: hallucinat*, Modifiers: audit, visual, olfact, tactil, third person, first person, 3rd person, 1st person,
Hallucinations - OTG	<p>Application to identifies when patients have olfactory, tactile and gestatory hallucinations.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: Seems to be having olfactory hallucination; in relation to her tactile hallucinations etc.</p> <p>Negative annotations include: denies auditory, visual, gustatory, olfactory and tactile hallucinations at the time of the assessment; denied tactile/olfactory hallucination etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	Keyword: hallucin*, Modifiers: olfactory, gustat, tactile

Helpless	<p>Application to extract occurrences of helplessness.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive mentions were fairly self-explanatory (Ideas of helplessness secondary to her physical symptoms present , ideation Compounded by anxiety and a sense of helplessness, hopelessness etc.)</p> <p>Negative mentions again were self-explanatory (Denies uselessness or helplessness , No thoughts of hopelessness or helplessness etc.)</p>	helpless
Hopeless	<p>Application to extract occurrences of hopelessness.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive mentions were fairly self-explanatory (feeling very low and hopeless , says feels hopeless etc.)</p> <p>Negative mentions again were self-explanatory (Denies hopelessness , No thoughts of hopelessness or helplessness etc.)</p> <p>Unknown mentions again were self-explanatory (unable to say if he feels hopeless etc)</p>	hopeless
Hostility	<p>Application to extract occurrences where hostility is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: increased hostility and paranoia, she presented as hostile to the nurses etc.</p> <p>Negative annotations include: no hostile, Denied any feelings of hostility etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	hostil*
Immobility	<p>Application to extract occurrences where immobility is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: on occasions she feels miserable and low due to her immobility, Recent immobility is a sudden change over the last week or so etc.</p> <p>Negative annotations include: immobile swelling approx 5cm above ankle on anterior shin, no immobility etc.</p> <p>Unknown annotations include: annotations include unclear statements such as to have injections Mon and will be immobile early next week as a result etc.</p>	immobil
Insight	<p>Application to extract occurrences of patient insight.</p> <p>Classes produced: Positive, Negative</p> <p>Positive = good insight</p> <p>Negative = bad insight</p>	
Insomnia	<p>Application to extract the occurrence of Insomnia. Classes produced - Positive, Negative and Unknown. <b>Positive mentions</b> included any insomnia described (including initial insomnia, middle insomnia), any assumed application to the patient - 'the insomnia', complaining of insomnia, taking X for insomnia, contributes to her insomnia, problems with insomnia, this has resulted in insomnia, this will address his insomnia. <b>Negative mentions</b> again were self-explanatory (no anhedonia, no evidence of anhedonia, not anhedonic etc.)</p> <p><b>‘Unknown’ annotations included:</b> i) used in a list, not applying to patient (e.g. typical symptoms include ...); ii) uncertain (might have anhedonia, ?anhedonia, possible anhedonia); iii) not clearly present (monitor for anhedonia, anhedonia has improved); iv) listed as potential treatment side-effect; v) vague (‘she is not completely anhedonic’, ‘appears almost anhedonic’)</p>	insom*
Irritability	<p>Application to extract the occurrences of Irritability. Classes produced - Positive, Negative and Unknown. <b>Positive mentions</b> included both observed and self-reported/subjective irritability, ‘can be irritable’, ‘became irritable’, ‘appeared irritable’, ‘complained of feeling irritable’.</p> <p><b>Negative mentions</b> included no evidence of, no longer, no sign of (again, both observed and subjective)</p> <p><b>‘Unknown’ annotations</b> included unclear statements, irritable bowel syndrome, ‘becomes irritable when unwell’, early warning sign, [relative] gets irritable, listed as potential side effect / withdrawal symptom, ‘can be irritable if ...’ [NB some ambiguity with positive ‘can be’ mentions, although linked here with the ‘if’ qualifier], ‘less irritable’.</p>	irritabl*

Low Mood	<p>Application to extract occurrences of low mood. Classes produced: Positive and Negative. <b>Positive annotations</b> applied to any description of 'low' applied to mood: describes mood as generally low; appears a bit low in mood; experiencing signs of anxiety and low mood; feels low in mood; subjectively – low in mood; remains low in mood; difficulties with low mood; complaining of ... low mood ...; his recent misery and low mood; suffering from low mood.</p> <p><b>Negative annotations</b> applied to adjectives describing mood as: normal; good; euthymic; alright; reactive.</p> <p><b>No 'unknown' annotations.</b> NB no attempt to distinguish the above annotations in terms of whether subjective or objective mood was sought – just focusing on words describing 'mood'.</p>	mood
Mannerism	<p>Application to extract occurrences where mannerism is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: covering his face with a scarf, laughing inappropriately, and talking to himself, prating, and exhibiting frequent mannerisms, the episodes/repetitive mannerisms could be attributed to excitement and an attention seeking component etc .</p> <p>Negative annotations include: Somewhat dramatic in his mannerisms, using hand gestures to emphasise his speech, no mannerisms apart from moving his mouth etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	mannerism
MDMA	<p>To identify patients who have been exposed to MDMA</p> <p>Classes produced: Positive, Negative</p> <p>Positive: A positive for a highlighted sentence that indicates an exposure of the patient, past or present, to MDMA.</p> <p>Negative: A negative indicates that the highlighted sentence shows an explicit lack of use or exposure to MDMA.</p>	
Mood Instability	Application to extract occurrences where mood instability is apparent.	
Mutism	<p>Application to extract occurrences where mutism is apparent.</p> <p>Classes produced: Positive and Unknown.</p> <p>Positive annotations include: She has periods of 'mutism' Issues with landlord, he did not respond any further and remained mute etc.</p> <p>Unknown annotations include: annotations include unclear statements such as that her mother is mute, Body language muted etc.</p>	mute, mutism
Negative Symptoms	Application to extract mentions of the term negative symptoms.Classes produced- Positive, Negative, Unknown.	negative symptom
Paranoia	<p>Application to extract occurrences where paranoia is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: vague paranoid ideation, cause him to feel paranoid etc.</p> <p>Negative annotations include: denied any paranoid, no paranoid feeling etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	paranoi*
Persecution	<p>Application to extract occurrences where persecution is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: she was having delusions of persecution, She suffered persecutory delusion etc.</p> <p>Negative annotations include: Denies persecutory delusions, He denied any worries of persecution etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	persecu*
Perseverance	<p>Application to extract occurrences where perseverance is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: which might manifest themselves in poor organisation skills and a tendency to perseverate; Thought: Contents - perseverates re hospitalisation in ... etc</p> <p>Negative annotations include: no evidence of any flights of ideas, perseveration or circumstantialities noted; indicated that she was happy to persevere with her current regime etc</p> <p>Unknown annotations include: annotations include unclear statements.</p>	persev*



Poor Motivation	<p>Application to extract occurrences of poor motivation. Classes produced - Positive, Negative and Unknown. <b>Positive annotations</b> applied to any statement describing motivation as poor or diminished: lack of; lacking in; does not have the M to ...; finds it difficult to M herself; poor M; is not motivated to ...; amotivation; zero motivation; unmotivated; reduced M.</p> <p><b>Negative annotations</b> applied to any statement describing motivation as good or normal: denies difficulties with M; good M; appears motivated to ...; highly motivated.</p> <p><b>No ‘unknown’ annotations.</b> NB annotations above were applied regardless of what the motivation was focused on (i.e. including both general statements of good/poor motivation, and also task-specific statements of motivation to do XX or YY)</p>	motivat
Posturing	<p>Application to extract occurrences where posturing is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: he remained in an immobile posture, Stillposturing in the corridor or sitting in a dark interview room etc.</p> <p>Negative annotations include: No abnormal movement or posture, He maintains an aggressive posture while he paces the unit etc.</p> <p>Unknown annotations include: annotations include unclear statements such as Her posture changed and she looked quite tearful etc.</p>	postur
Poverty of Speech	<p>Application to identify poverty of speech, developed as part of the Negative Symptoms of Schizophrenia project.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: He continues to display negative symptoms including blunting of affect, poverty of speech; He does have negative symptoms in the form of poverty of speech etc.</p> <p>Negative annotations include: No poverty of speech, There was no pressure or poverty of speech etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	Keyword: speech, Modifiers: poverty, impoverish
Poverty of Thought	<p>Application to extract whether poverty of thought is present.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive mentions include: poverty of thought was very striking, evidence of poverty of thought etc.</p> <p>Negative mentions include: no poverty of thought, no evidence of poverty of thought etc.</p> <p>Unknown mentions include: Present or Absent of Poverty of thought is not clear.</p>	poverty of thought
Pressured speech	<p>Application to extract occurrences where pressured speech is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: Talking with pressured speech; He had pressured speech etc.</p> <p>Negative annotations include: no pressure of speech, Her speech appeared normal in rate, volume and pressure etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	speech
Psychomotor	<p>Application to extract occurrences of psychomotor.</p> <p>Classes produced: Positive and Negative.</p> <p>Positive mentions were fairly self-explanatory (few spontaneous movements- psychomotor retardation etc.)</p> <p>Negative mentions again were self-explanatory (No psychomotor retardation etc.)</p> <p>Unknown mentions again were self-explanatory (unable to say if he feels hopeless etc)</p>	psychomotor

Rigid Dementia	<p>To identify patients who have rigidity as a symptom or sign in the context of dementia.</p> <p>Classes produced: Positive and Negative.</p> <p>Positive: Evidence of presence of rigidity as a symptom or sign.</p> <p>E.g. "However, he did have some rigidity", "He was not able to left his arm due to rigidity"</p> <p>Notes: All causes of rigidity have been accepted: including cogwheel, clasp-knife, lead-pipe, akinetic etc. Any causes of rigidity have been considered (Parkinsonism, NMS, seizure, catatonia). For annotation "abdominal rigidity" has been also considered as positive. Rigidity during nursing care has been accepted as positive as it has been no clear if is temporary or longstanding.</p> <p>Negative: No evidence of rigidity.</p> <p>E.g. "Arms examined- no evidence of tremor, rigidity or cogwheeling", "No rigidity noted".</p> <p>Unknown: The text is irrelevant or not clear to show if the patient has rigidity or not.</p> <p>E.g. "ZZZZ was rigid about food". "She prefers to have her medications in separate boxes and is very rigid with the administration". "He thought this was not the case and remained rigid in his beliefs....". Common irrelevant texts : rigid routine/practice, rigid outlook, rigid thinking/ thoughts/ beliefs/views, rigid expectations, rigidity of things to be done, rigidle asks for...., rigid eating/diet, rigid bronchoscopy.</p>	rigid*
Rigidity	<p>Application to extract occurrences where rigidity is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: he did have some rigidity, rigid body movements etc.</p> <p>Negative annotations include: No rigidity noted, No rigidity in all four limbs etc.</p> <p>Unknown annotations include: annotations include unclear statements such as He stated that rigid time slot would not be suitable, Her impression impression was a damaged man with rigid patterns of self-sabotage etc.</p>	rigid
Social withdrawal	<p>Application to identify social withdraw.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: She is withdrawn socially from friends and family, Mr ZZZZZ became very isolated and socially withdrawn etc.</p> <p>Negative annotations include: not being socially withdrawn, no evidence of socially withdrawn etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	withdraw*
Stereotype	<p>Application to extract occurrences where stereotype is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: he developed catatonic features - mannerisms and stereotypes; unable to sit still during interview with stereotypic and purposeless actions etc.</p> <p>Negative annotations include: no stereotypic behaviour, no evidence of stereotype etc.</p> <p>Unknown annotations include: annotations include unclear statements such as he mentions that he was not oblivious to the stereotype of children.</p>	stereotyp
Stupor	<p>Application to extract occurrences where stupor is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: Admitted with depressive stupor, Tonight ZZZZZ presented in a psychotic stupor etc.</p> <p>Negative annotations include: not in the state of stupor /confusional state, not suggestive of depressive stupor etc.</p> <p>Unknown annotations include: annotations include unclear statements such as On a few occasions he has resorted to drinking or smoking into a stupor in order to knock him self out etc.</p>	stupor

Suicide	<p>Application to extract suicide attempt (past or recent). Definition of Suicide Attempt from ICD 10 online (Intentional self-harm: X60 – X84)</p> <p>X60 - Intentional self-poisoning by and exposure to non-opioid analgesics, antipyretics and anti-rheumatics</p> <p>X61 - Intentional self-poisoning by and exposure to antiepileptic, sedative-hypnotic, anti parkinsonism and psychotropic drugs, not elsewhere classified</p> <p>X62 - Intentional self-poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified</p> <p>X63 - Intentional self-poisoning by and exposure to other drugs acting on the autonomic nervous system</p> <p>X64 - Intentional self-poisoning by and exposure to other and unspecified drugs, medicaments and biological substances</p> <p>X65 - Intentional self-poisoning by and exposure to alcohol</p> <p>X66 - Intentional self-poisoning by and exposure to organic solvents and halogenated hydrocarbons and their vapours</p> <p>X67 - Intentional self-poisoning by and exposure to other gases and vapours</p> <p>X68 - Intentional self-poisoning by and exposure to pesticides</p> <p>X69 - Intentional self-poisoning by and exposure to other and unspecified chemicals and noxious substances</p> <p>X70 - Intentional self-harm by hanging, strangulation and suffocation</p> <p>X71 - Intentional self-harm by drowning and submersion</p> <p>X72 - Intentional self-harm by handgun discharge</p> <p>X73 - Intentional self-harm by rifle, shotgun and larger firearm discharge</p> <p>X74 - Intentional self-harm by other and unspecified firearm discharge</p> <p>X75 - Intentional self-harm by explosive material</p> <p>X76 - Intentional self-harm by smoke, fire and flame</p> <p>X77 - Intentional self-harm by steam, hot vapours and hot objects</p> <p>X78 - Intentional self-harm by sharp object</p> <p>X79 - Intentional self-harm by blunt object</p> <p>X80 - Intentional self-harm by jumping from a high place</p> <p>X81 - Intentional self-harm by jumping or lying before moving object</p> <p>X82 - Intentional self-harm by crashing of motor vehicle</p> <p>X83 - Intentional self-harm by other specified means</p> <p>X84 - Intentional self-harm by unspecified means</p>	<p>asphyxiat*, to shoot herself, to shoot himself, to stab herself, to stab himself, after a suicide attempt, another attempt to end [0 to 1 word in between] life, another suicidal attempt, another suicide attempt, attempt on her life, attempt on his life, attempt to commit suicide, attempt to end her life, attempt to end his life, attempt to kill herself, attempt to kill himself, attempt to suicide, attempt to take her life, attempt to take his life, attempted to commit suicide, attempted to end her life, attempted to end his life, attempted to kill herself, attempted to kill himself, attempted to take her life, attempted to take his life, attempts [1 to 3 words in between] suicide, attempts [0 to 2 words in between] suicide, attempts suicide, depression with suicide attempt, E850, E851,E852,E853,E854,E855, E856, E857,E858,E950,E951,E952,E953,E954,E955,E956,E957,E958,E959,E980,E981,E982,E983,E984,E985,E986, E987,E988,E989,failed suicidal attempt, failed suicide attempt, first attempt at her life, first attempt at his life, following a suicide attempt, following her suicidal attempt, following her suicide attempt, following his suicidal attempt, following his suicide attempt, he jumped off a bridge, his suicide attempt was not successful, history of suicide attempt, in an attempt to kill herself, in an attempt to kill himself, leapt in front of motor, leapt in front of moving, leapt in front</p>
Tangential Speech	<p>Application to extract occurrences where tangential speech is apparent.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: He was very tangential lacked goal directed thinking, There was evidence of tangential etc.</p> <p>Negative annotations include: no evidence of formal thought disorder or tangentiality of thoughts; however there was no overt tangentiality or loosening of associations etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	<p>tangent*</p>
Tearful	<p>Application to extract occurrences of tearful. Classes produced: Positive, Negative and Unknown. <b>Positive annotations</b> include: appeared tearful; was tearful (including was XX and tearful; was tearful and YY); became tearful; moments of tearfulness; a bit tearful.</p> <p><b>Negative annotations</b> include: not tearful; no tearfulness; denies feeling tearful; no tearful episodes.</p> <p><b>‘Unknown’ annotations</b> were mostly ambiguous statements (e.g. less tearful; couldn’t remember being tearful) and statements applying to another person (e.g. mother was tearful) or a person who was not clearly enough the patient.</p>	<p>tearful</p>
Thought block	<p>Application to extract whether thought block is present.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: Showed some thought block; thought block and paucity of thought etc.</p> <p>Negative annotations include: Denies problems with thought insertion; No formal thought disorder etc.</p> <p>Unknown annotations include: annotations include unclear statements.</p>	<p>thought block</p>

Treatment Resistant Depression	<p>Application to extract occurrences of treatment resistant depression.</p> <p>Classes produced: Positive and Negative.</p> <p>Positive annotations were fairly self-evident: has X year history of treatment resistant depression, problems with low mood (resistant depression), diagnosis: treatment resistant depression, resistant endogenous depression, suffers from chronic treatment resistant depression, referred for management of treatment resistant recurrent depression.</p> <p>‘Unknown’ annotations included the following: ‘talked about ways in which they might resist allowing each other’s depression to ...’, ‘has a diagnosis of treatment resistant schizophrenia and depression’, ‘this could make depression resistant to treatment’, ‘we discussed him enrolling for a study of treatment resistant depression’, ‘the advice was that venlafaxine was a good option in treatment resistant depression’, ‘we talked about medication for treatment resistant depression’, ‘resisted antidepressant therapy for a number of years’, ‘needs an assessment to rule out treatment resistant depression’, ‘assess whether depression was resistant to mirtazapine’, ‘accepts that ECT is a strategy for treatment resistant depression’.</p> <p>NB. There were no negative annotations (i.e. no statements to say that someone did not have treatment resistant depression). On the database examined, the unknown annotations above were all labelled as ‘negative’, so this may need to be borne in mind when cross-evaluating.</p>	[Rr]esist* [0-8 words in between] [Dd]epression
Tremor	<p>To identify patients who have rigidity as a symptom or sign in the context of dementia.</p> <p>Classes produced: Positive and Negative.</p> <p>Positive: Evidence of presence of rigidity as a symptom or sign.</p> <p>E.g. “However, he did have some rigidity”, “He was not able to left his arm due to rigidity”</p> <p>Notes: All causes of rigidity have been accepted: including cogwheel, clasp-knife, lead-pipe, akinetic etc. Any causes of rigidity have been considered (Parkinsonism, NMS, seizure, catatonia). For annotation “abdominal rigidity” has been also considered as positive. Rigidity during nursing care has been accepted as positive as it has been no clear if is temporary or longstanding.</p> <p>Negative: No evidence of rigidity.</p> <p>E.g. “Arms examined- no evidence of tremor, rigidity or cogwheeling”, “No rigidity noted”.</p> <p>Unknown: The text is irrelevant or not clear to show if the patient has rigidity or not.</p> <p>E.g. “ZZZZ was rigid about food”. “She prefers to have her medications in separate boxes and is very rigid with the administration”. “He thought this was not the case and remained rigid in his beliefs....”. Common irrelevant texts : rigid routine/practice, rigid outlook, rigid thinking/ thoughts/ beliefs/views, rigid expectations, rigidity of things to be done, rigide asks for...., rigid eating/diet, rigid bronchoscopy.</p>	tremor*
Weightloss	<p>Application to extract occurrences of weight loss.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: appeared tearful; was tearful (Significant weight loss, pleased with her weight loss).</p> <p>Negative annotations include: no weightloss; denies weightloss.</p> <p>Unknown annotations include: To maintain adequate dietary intake and avoid weight loss, The latter reduced in line with weight loss.</p>	weight loss, weight lost, loss weight, lost weight
Worthless	<p>Application to extract occurrences of worthlessness.</p> <p>Classes produced: Positive, Negative and Unknown.</p> <p>Positive annotations include: appeared tearful; was tearful (feeling worthless, feels hopeless and worthless).</p> <p>Negative annotations include: no worthlessness; denies worthlessness etc.</p> <p>Unknown annotations include: his father had told him that he was worthless, would call them worthless etc</p>	worthless

Table B: parameters and value ranges used in model tuning

Parameter	Value Range
C	0.01, 1, 10, 1000

dual	FALSE
class_weight	balanced, None
loss	squared_hinge

Table C: Final parameter values selected via model tuning for each feature set

STRUCT	
Parameter	Value
C	0.01
dual	FALSE
class_weight	balanced
loss	squared_hinge
GATE	
Parameter	Value
C	0.01
dual	FALSE
class_weight	balanced
loss	squared_hinge
TFIDF	
Parameter	Value
C	1
dual	FALSE
class_weight	balanced
loss	squared_hinge
STRUCT+GATE	
Parameter	Value
C	1
dual	FALSE
class_weight	balanced
loss	squared_hinge
STRUCT+TFIDF	
Parameter	Value
C	0.01
dual	FALSE
class_weight	None
loss	squared_hinge
GATE+TFIDF	
Parameter	Value
C	0.01
dual	FALSE
class_weight	None
loss	squared_hinge

STRUCT+GATE+TFIDF	
Parameter	Value
C	1
dual	FALSE

class_weight	balanced
loss	squared_hinge

# General Experimental Architecture

